

P2 IN ACQUISITION SUCCESS STORY: NEXT GENERATION ATTACK SUBMARINES

“The VIRGINIA Class Submarine Program is fully committed to ensuring that the next class of attack submarines will be designed and constructed so that the operation, deployment, and maintenance, overhaul, and ultimate disposal of the submarine will meet all applicable environmental requirements.”

*— Captain Dave Burgess
VIRGINIA Class Program Manager (Dec 94)*

NAVSEASYS COM has successfully incorporated pollution prevention principles throughout the design phase of the new VIRGINIA Class submarine. As a result of these efforts, the Navy will benefit from a significant savings of time, money and other resources well into the future. P2 in acquisition is one of the cornerstones of the Navy's Environmental Program. The Navy Acquisition Organization is working with the Environmental Program to ensure that the acquisition community considers life-cycle environmental factors in new weapon system acquisition. The VIRGINIA Class submarine is one of several similar on-going projects in this arena.

When President Clinton signed Executive Order (EO) 12856, which addressed P2 at Federal facilities, the Department of Navy (DoN) accelerated its ongoing initiatives. DoN's basic P2 plan is to identify the use of HMs in existing operations; to identify and evaluate alternatives to the HMs; to work with the other services to develop, test, and demonstrate environmentally preferable alternative technologies; and to implement alternatives thereby integrating P2 into all acquisition procurement. The overall approach is to move the solution further “up the pipeline,” to ensure that the materials and processes used to manufacture, operate, and maintain mission systems reduce both environmental impact and life cycle costs.

Navy Pollution Prevention Program Elements

- CHRIMP
- P2 Information Sources
- Centralized P2 Procurement
- Pollution Prevention Approach to Compliance Efforts (Marine Corps)
- Toxic Release Inventories
- P2 Afloat
- P2 In Acquisition
- Ozone Depleting Substances

The development phase of the VIRGINIA Class submarine project began in 1993. The first new submarine is scheduled to be deployed in 2006 and will be retired and scrapped after approximately 30 years. Despite the fact that P2 in Acquisition was still a relatively new concept in the early nineties, the VIRGINIA Class environmental program established a pollution prevention strategy early on in the design process. As illustrated in Exhibit 1, the Navy raised environmental issues to the same level as other design considerations. Doing so enabled the design engineers to give environmental impacts equal attention. At the same time, it helped determine if the platform will meet environmental requirements with minimal impact on readiness, cost, and schedule.

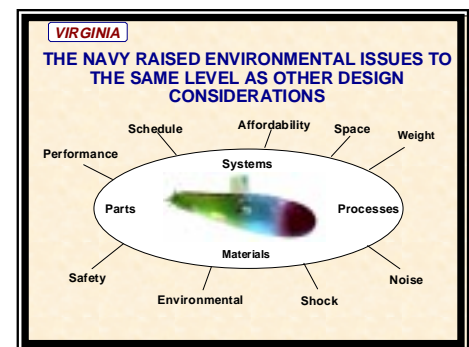


Exhibit 1. Design Considerations

The environmental program's strategy consisted of the following major steps:

- Create a life cycle environmental management team
- Develop a pollution prevention strategy
- Establish an environmental compliance team
- Prepare an environmental implementation plan
- Coordinate with Puget Sound Naval Shipyard on the preparation of a disposal plan
- Develop tools for environmental analysis

Each of these steps is described below.

Create A Life Cycle Environmental Management Team

Incorporating environmental considerations into a new weapon system is a daunting task both because of the number of organizations involved and the technical complexity. Many organizations must fully support the effort and contribute their expertise to the decision making process. The VIRGINIA Class submarine project involved:

DoD Cross-Feed

- the Acquisition Program Manager
- the Navy policy and legal office
- facility command
- Navy technical design codes
- maintenance organizations
- shipbuilders
- design agent
- operating forces
- supply command
- Navy laboratories
- disposal shipyard
- PARMS

The team members represent the full spectrum of organizations that will be involved in every stage of the new submarine's design, construction, operation, maintenance, and disposal. By involving each of these organizations early on in the process, the environmental program greatly reduced the likelihood of encountering both organizational resistance as well as technical difficulties. Incorporating pollution prevention in the VIRGINIA Class submarine is further complicated by the fact that the Navy is still in the process of reviewing all of the military specifications and other technical requirements to eliminate hazardous materials wherever possible. Each of these organizations played a vital role in identifying potential roadblocks and proposing acceptable solutions.

Develop A Pollution Prevention Strategy

Working together, members of the Environmental Management Team developed a pollution prevention strategy that served as a basis for evaluating environmental concerns. The strategy's major objectives are to:

- comply with applicable environmental requirements
- identify hazardous material targeted for reduction
- control the use of hazardous materials and generation of hazardous and non-hazardous wastes
- reduce the potential for environmental clean-up and remediation liabilities

These objectives mirror the Navy environmental program's goals.

Establish An Environmental Compliance Team

The environmental management team worked closely with the main contractor, the Electric Boat Corporation (EB) to implement the pollution prevention strategy. For its part, EB formed an environmental compliance team to integrate pollution prevention.

Prepare An Environmental Implementation Plan

EB also developed an implementation plan that explains how it will perform a detailed environmental analysis. The implementation plan has four major components:

- a plan for training all Design/Build teams in pollution prevention and compliance
- an assessment of laws and regulations for the VIRGINIA life cycle
- an environmental analysis on a ship-system basis
- a hazardous material map identifying the location of hazardous material

Coordinate With Puget Sound Naval Shipyard On The Preparation Of A Disposal Plan

The Puget Sound Naval Shipyard (PSNS) is another key player on the environmental management team. Since 1990, PSNS has been responsible for recycling submarines and ships. 72 submarines have been recycled to date. The VIRGINIA Class submarine is unique because it has been designed with the end-of-life recycling process in mind. PSNS educated team members about the circumstances that can prevent the shipyard from being able to fully recover valuable materials for recycling. Exhibit 2 gives examples of these issues and the team's resolution.

Design Environmental Analysis Tools

At the macro-level, the team worked with PSNS to address these issues by designing:

- a disposal plan

DoD Cross-Feed

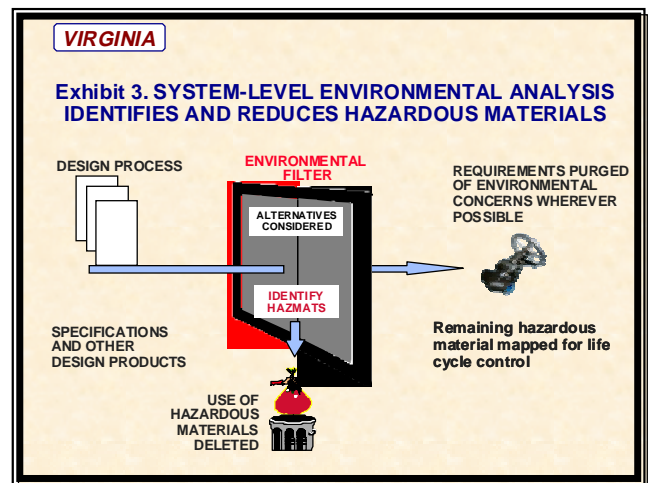
- a computer-based system level environmental analyses
- a Hazardous Material map
- a refurbishment / reuse / recycling program

| Issue | Mitigation |
|---|--|
| Drawings/specifications are not specific or accurate regarding hazardous materials | Over 1,400 primary references, mil specs, tech manuals and MRCs were reviewed to eliminate or reduce the use of hazardous materials such as cadmium and chromium |
| Materials that are not considered hazardous during construction are hazardous waste at time of disposal | Increased design sensitivity to changing regulations/disposal processes and creation of the Hazmat Map |
| Material/hazardous materials changes are not documented over the ship's lifecycle | Design/Build Environment Analysis/Hazmat Map |
| Expensive sampling and analysis required at disposal | Design/Build Environment Analysis/Hazmat Map |

Exhibit 2. Examples of Hazmat Issues and Resolution

These tools guided the choice of materials used in constructing the submarine. The team relied on the system level environmental analysis to identify hazardous materials and to find ways to reduce them. Exhibit 3 illustrates the analytical process. Requirement specifications were purged of environmental concerns wherever possible. During the course of preparing the environmental analysis, the team focused on seven key types of information that are necessary for life cycle hazardous material management:

- system descriptions
- hazardous material constituents
- waste streams for construction, testing, operations, maintenance, shore support, and disposal
- environmental and human health effects
- alternative materials and processes
- opportunities for refurbishment and reuse
- rationale for decision



Disposal wastestreams are also evaluated in the system-level environmental analyses. The database contains graphics that illustrate where the environmental issues are located. Any hazardous materials that could not be eliminated are captured in the database in the Hazmat Map. The Hazmat Map identifies the location of hazardous materials at the level of individual parts so that the materials can be tracked throughout their life cycle – through home port maintenance requirements, disposal, and recycling. The Hazmat Map provides information needed for disposal operations by:

- Identifying where hazardous material is located on the ship
- Locating parts containing hazardous material by system, drawing, component, and part number
- Characterizing a part's complete chemical makeup, so that materials - not of concern today, but categorized as hazardous in the future - can be located
- Maintaining hull-specific information up-to-date for the life cycle of the ship

The Hazmat Map provides vital information for disposal activities because it:

- Accurately locates hazardous material for planning disposal operations
- Locates all materials, even those not now considered hazardous
- Provides a continually updated decision-making tool for material use, recycling, and disposal
- Reduces disposal cost by eliminating lengthy material reviews and analyses

The team evaluated various consumable products used during the life cycle of the submarines. The number of products approved for use was dramatically reduced: for example, the number of adhesives, sealers, and fillers, and threadlockers

was reduced from 148 to 67; the number of paints was reduced from 107 to 67; and the number of solvents was reduced from 77 to 15. In addition, the bilge water processing tank was redesigned to meet the current disposal requirements.

Summary

The VIRGINIA Class submarine project demonstrates a pioneering, and successful approach for incorporating environmental considerations in a major new weapon system. As a result, the new submarine will have greatly reduced environmental impacts throughout its life cycle while still performing its intended mission.